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Zero Retries is an independent newsletter promoting technological innovation that is occurring in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 1400+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

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Web version of this issue - <https://www.zeroretries.org/p/zero-retries-0145>

Request To Send

Commentary by Editor Steve Stroh N8GNJ

Major Conference Countdowns:

- [Hamvention 2024](#) in Xenia, Ohio, USA on 2024-05-17 thru 19, in *07* weeks!
 - [HAM RADIO 2024](#) in Friedrichshafen, Germany on 2024-06-28 thru 30, in *10* weeks!
 - [JARL Ham Fair 2024](#) in Tokyo, Japan on 2024-08-24 and 25, in *21* weeks!
-

Data Communications on Amateur Radio HF

As I've said, I'm a big fan of Jeff Davis KE9V's series **The Zombie Apocalypse** in which Amateur Radio is a significant plot element. I'm not going to naysay any of the plot elements; *he's the writer, thus it's his story to tell*. Good stories *make you think*, and one paragraph in [TZA Episode 9](#) made me think:

Oddly enough, amateur radio was the most consistent form of data transfer available and some limited regions were beginning to rely on the information it exchanged. Though it was a throwback to the 1950's, message handling was being done by ham radio traffic networks the old-fashioned way, via phone and Morse code as these could be maintained without need of computers or internet connectivity. These were limited to populous regions and messages often took days or weeks to be delivered, when they could be delivered at all. Still, this was impressive to Clinton given that most older hams, like himself, who had traffic handling experience, probably didn't survive the ordeal. He thought it amazing this was now being handled by the whizz kids, without their computers, forced to rely on Morse code and a pencil to carry on the tradition and they seemed to be doing well.

One of the premises of TZA is that most electronic equipment was no longer functional, but it seems to me that computers are now *so* ubiquitous¹ to the point that a reasonable number of computers *would* survive, and (at least in my way of thinking) Amateur Radio Operators would be one of the best uses of computers for (faster than manual) data communications on HF. With *that* thought rattling around in the back of my mind, when I received an email from a Zero Retries reader about HF data communications, that quickly triggered the article **Continuing Development (Fork) of ARDOP** in this issue.

73,

Steve N8GNJ

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M17 Announces New Open-Source Hardware for Amateur Radio Enthusiasts and Enhancements to Current Offerings

Supplementary commentary by Steve Stroh N8GNJ

This article is a joint press release from ARDC and M17 Project. I wouldn't normally feature a press release verbatim in Zero Retries, but this one is perfectly aligned as Zero Retries Interesting (despite some awkward phrasing such as "Amateur Radio Enthusiasts"). All three of these projects by M17 have been previously discussed in Zero Retries, thus this serves as an update on these projects.

M17 launches innovations in hardware, software, and UHF/VHF digital voice protocols, all of which are open-source.

March 29, 2024 — Funded by a grant from Amateur Radio Digital Communications (ARDC), M17 is

excited to announce enhancements to their current hardware solutions for amateur radio operators as well as a new hardware offering:

- **Module17** – an M17 modem that converts a 9600 baud capable radio into an M17 transceiver;
- **OpenHT** – a cutting-edge QRP dual-band handheld transceiver (HT) that utilizes SDR technology; and
- **[NEW] Remote Radio Unit (RRU)** – a comprehensive, UHF FM/M17 ‘repeater in a box’, optimally designed for close antenna placement, enhancing signal strength and reliability.

Module17 is undergoing significant enhancements, evolving from revision 0.1e to 1.0. Improvements to Module17 will focus on design and ergonomics, featuring an extruded aluminum case for aesthetic appeal. The anticipated release of revision 1.0 is forthcoming. In the interim, a preview revision 0.99 is available, which addresses previous non-critical hardware bugs.

OpenHT is one of the pioneering open-source SDR HTs available, potentially the first of its kind. Its prototype, released last year, supports 70cm and 13cm bands, offering versatile transmission capabilities such as FM (including M17), AM, SSB, BPSK/QPSK, and higher order modulations, such as 16QAM. M17’s ongoing development efforts include VHDL Hardware Description Language (VHDL) code for the programmable logic components of the radio, further enhancing its functionality.

Work is also underway for the development of a **RRU transceiver**, aiming to provide a comprehensive FM/M17 repeater for remote sites or masts. The RRU includes features such as an N connector for direct antenna connection, eliminating the need for a long coax, and a multimode optical fiber duplex pair, allowing for improved RF performance. The RRU supports SDR IQ transceivers, allowing for additional modes, and can also output RF power exceeding 50W (CW). The current working prototype, revision B, facilitates linking to M17 reflectors and integrates Raspberry Pi interface software for M17 reflector linking.

All of the aforementioned hardware is developed entirely from open-source designs, adhering to TAPR, CC BY-NC-SA 4.0 and/or GNU GPLv2/v3 licenses, exemplifying M17’s commitment to innovation and community collaboration.

“I believe the work done by our Project's team and contributors will free the amateur radio community from the use of proprietary digital voice modes, also allowing for easier data transfer,” says M17 Founder and Lead Developer Wojciech Kaczmarski (SP5WWP). “We have achieved a lot already, yet still there's plenty of work ahead of us. I encourage everyone to join the effort, as the Project won't succeed without community's help.”

To learn more about M17, visit <https://m17project.org/>.

End press release.

It’s really good to see that M17 is taking advantage of its ARDC grant to push forward these projects to (apparent) completion and wide availability. During my involvement with ARDC on its Grants Advisory Committee, I “fought hardest” for transformative projects like the grant to M17 to tackle projects that were too big or too speculative for commercial development, or didn’t offer a competitive advantage to commercial developers to be assured of a return on their investment. I continue to characterize ARDC grants as “venture capital² for Amateur Radio research and development”.

When I first began interacting with M17 Project, I made the point that Module 17 (which was then purely a prototype / proof of concept) was good enough and just needed to be made “available to the masses”. At that time, you *could* make your own Module 17 - first you had your own printed circuit board made, then you sourced the components... etc. Obviously that was a non-starter for all but the most technically

ambitious folks, and didn't do much to encourage M17 activity. Kudos that Module 17 is now going to be a product, not just a project.

The OpenHT is an impressive, ambitious project, but [reading about it](#), if you've been following developments in technological innovation in Amateur Radio here in Zero Retries, OpenHT feels like a development whose time has come. OpenHT is similar in scope to an earlier project - [Whitebox / Katena](#) that was begun by Bruce Perens K6BP and Chris Testa KD2BMH in 2016. Unfortunately, at that time, the technology wasn't quite up to the scope of the project. Eight years later, the radio components, the processors, and the software framework are now widely available. Most importantly, in tackling the OpenHT, the ARDC grant that M17 received provided funding to "pay their way over the rough spots" such as tricky radio frequency design issues. But the biggest indicator of potential success for OpenHT is a *significant use case* that's lacking in any other project - a "native" implementation of the brand new, open source, designed by Amateur Radio for Amateur Radio **M17 mode**.

As for the **Remote Radio Unit (Repeater)**, I *gushed about that project more than a bit* in **Zero Retries 0130** - Remote Radio Unit for M17 / FM Repeaters. The RRU (Repeater) is a fantastic example of out-of-the-box thinking of a radio system designed *by Amateur Radio for (the unique needs and requirements of) Amateur Radio*. There are just so many things to admire about the scope of the RRU - using fiber optic communications between the unit and its base, that it's essentially a Software Designed Transceiver, reasonable power output for UHF operations, etc. It's interesting that the RRU debuted not long after the [Icom IC-905](#) which also mounts "most of the electronics" remotely on the tower near the antenna. In my opinion, the RRU is more technically sophisticated than the IC-905 in some ways such as using of fiber optic communications, and being able to add modes and features *through software changes determined by the user*.

I hope that M17, perhaps in conjunction with a company comfortable with open source (Crowd Supply, perhaps?) is able to bring all three of these units to some kind of public availability for those that aren't quite up to "build it yourself" as M17 offered with the early versions of the Module 17.

Similarly, I hope that *ARDC is able to learn from the significant potential of these three projects that could significant advance Amateur Radio technology...* that there's a huge gap between prototype development (easy) and "getting hardware into people's hands" (hard, expensive). Amateur Radio used to have many companies such as PacComm, MFJ Enterprises, Advanced Electronics Applications, and TAPR, that eagerly stepped into that role. But there are only a few now, and they need encouragement. Perhaps ARDC could do Requests For Proposals (RFPs) to manufacture "seed" quantities of units that would pay for the non-recurring engineering and initial product costs.

But, for now, it's gratifying to see the progress that has been made by M17 for these three new projects that even in a prototype phase, do advance Technological Innovation in Amateur Radio.

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Continuing Development (Fork) of ARDOP

By Steve Stroh N8GNJ

Data communications on Amateur Radio HF bands are an important capability to be able to exchange reasonable amounts of arbitrary data (file transfers) within a reasonable time without requiring any infrastructure (repeaters, microwave networks, Internet, etc.) other than two or more similarly equipped HF radios. For example, using HF to exchange Bulletin Board System (BBS) messages and bulletins between BBS systems that cannot connect via VHF, microwave, or Internet.

While there are many data communications systems in use on Amateur Radio HF bands, two specific “reasonably fast” and “reasonably reliable” systems seem to be primary - [VARA HF software](#) and [modem units from SCS that implement the SCS Pactor-4 protocol](#). For many Amateur Radio Operators, VARA HF works so well, for the reasonable cost (\$69) for a VARA license key, “fast” data communications on Amateur Radio HF is a solved problem.

But, both VARA and Pactor-4 are proprietary technology, and thus not open to experimentation and improvement. Thus there is continuing interest in developing new “reasonably fast” and “reasonably reliable” systems for use on Amateur Radio HF bands.

[ARDOP \(Amateur Radio Digital Open Protocol\)](#) was an ambitious project begun by Rick Muething KN6KB of Amateur Radio Safety Foundation (Winlink) in 2015 to develop a new HF data protocol as a replacement for the earlier Winlink Message Over Radio (WINMOR) “transport” protocol previously used in Winlink clients and servers. Goals for ARDOP included:

- Hardware compatibility – accommodate frequency accuracy of typical HF and VHF / UHF radios, majority of audio interface (“Sound cards”), all popular methods of Push-To-Talk (PTT), and flexible host interface (TCP/IP socket or serial).
- Use of Forward Error Correction (FEC) and Automatic Retry Request (ARQ) for error free data transfer.
- A broadcast / multicast mode using FEC.
- Automatic adjustment of timing parameters, including for use with VHF / UHF voice repeaters, round trip timing, latencies in the operating system (if any), TX delay, networking, etc.
- “Handshake” between two stations to establish common parameters such as channel size (200, 500, 1000, or 2000 Hz), modulation method, and forward error correction (FEC) to maximize the fastest possible error-free data transfers.
- Strong resistance to multipath distortion on HF.
- Listen-before-transmit mechanism to avoid causing interference with a communication in progress.
- Agnostic implementation – software on host computer (“Sound card” mode) or dedicated processor / DSP (real-time or no operating system).

An additional goal of ARDOP was to be compliant with the the arcane US FCC symbol rate limitations (maximum of “300 baud”), but in 2024, that is no longer an issue given US / FCC regulations were recently rewritten to remove “baud rate” limitations and specify a maximum bandwidth of 2.8 kHz.

There were two “stable code” implementations of ARDOP:

- ARDOPc v13 by John Wiseman G8BPQ, for Linux
- WIN_ARDOP4 v1 by Rick Muething, for Windows

When I last researched ARDOP in 2023, ARDOP development appeared to be stalled, likely because VARA had proven to be “reasonably fast” and “reasonably reliable”, to the point that many considered VARA to be good enough.

Forking ARDOP For Continued Development

Thus it's interesting to note that development of ARDOP has been restarted as a "forked" software project.

[Peter LaRue KG4JJA on the users@ardop.groups.io mailing list](mailto:users@ardop.groups.io) (2024-03-22):

A few months ago I started working on some improvements to a fork of John Wiseman's [G8BPQ] multi-platform implementation of [ARDOP] because the existing version was not working properly on the hardware I was using. I pushed some of that work to a Github repository at <https://github.com/pflarue/ardop>. Regrettably, today I have deleted that repository from Github.

A few weeks ago I realized that there was no clear license statement in the repository I forked to begin my edits. I had originally misinterpreted a license statement for one of the libraries used for [ARDOP] to apply to the entire repository. So, I proposed to John Wiseman whose code I forked and to Rick Muething [KN6KB], who wrote the specification and original implementation of ARDOP, to explicitly release my fork under the open source MIT license with all three of our names. John quickly agreed to this, which I appreciate. Unfortunately, after repeated attempts to contact Rick via multiple channels, he never responded to my proposal. Without clear licensing from the earlier developers, I do not feel that I have the legal right to share my own edited version.

While Rick wrote in the ARDOP Specification that "The specification and the protocol will be released to the public domain." and "It is recommended but not required that software or firmware implementations of the ARDOP be released as open source", I know of no public statement from him that that his own implementation was ever released under any open source license.

If I later receive approval from Rick, I will once again make my edits available to others. Lacking that, I intend to write a new open source and well documented implementation of [ARDOP] in clean modern c++. However, this will take a while, in part because I don't yet have the ability to write all of the required code. My study of DSP and other topics related to digital communications is ongoing. If and when that code becomes sufficiently usable for others to begin testing or using it, I will post an announcement to this group. Happily, in contrast to VARA, the ARDOP specification is sufficiently detailed to allow a new implementation to be written, and while not released under an open source license, the source code for extant reference implementations can be consulted to clarify any protocol details that may be unclear in the specification.

Later post by KG4JJA (2024-03-25):

My understanding is that significant portions of John's [ARDOP] implementation are translations of Rick's code with only the minimal edits required to translate it from Visual Basic to c. Thus, I feel that I need consent from both of them to apply a new license to my fork of this code.

After my recent post here, I received an email from Rick in which he gave me permission to use, expand, modify, or improve the ARDOP code. I hope that this means that he will also permit me to release it under the MIT open source license as I had previously requested. I wrote him back asking for clarification of this, and am waiting for a response.

And finally KG4JJA posted (2024-03-27):

Good news! Rick has agreed to permit redistribution of changes to [ARDOP], as John had

already done.

So, within the next few days I'll be restoring my fork of John Wiseman's [ARDOP] repository at GitHub with a new MIT open source license file. Soon thereafter I'll be posting a new release with binaries for both Windows and Linux.

This may take a few days because I need to get to a spot with better internet access to push changes to GitHub.

I am also working on some further changes. The one that I'm most excited about for my own use, as well as for anybody else running [ARDOP] on a headless server (I'm using a Raspberry Pi Zero 2W) along with Pat Winlink, is a new [ARDOP] GUI that runs in a browser windows (like the http UI for Pat). Like the Windows and Linux desktop versions of the [ARDOP] GUI, it will display a waterfall of received audio, a constellation plot indicating the quality of received frames, and show frame types sent and received. It will also allow the user to send tuning signals and adjust the transmit drive level. That and other additional features still need some work, but they are coming.

Watch this [ARDOP] Users group for future notifications that I'll post when new updates are available.

Thanks to Rick Muething KN6KB and John Wiseman G8BPQ for giving me permission to share my changes, and for their hard work to produce the source code that I'm working from.

I was initially confused why KG4JJA was reluctant to make use of a [*specification*](#), for ARDOP (which an advisor confirmed is not copyrightable), but he explained his concern that G8BPQ's ARDOP software potentially incorporated software by KN6KB.

ARDOP + OFDM?

The KG4JJA ARDOP fork of G8BPQ's ARDOP software doesn't currently include an experimental version of G8BPQ's ARDOP software that incorporates Orthogonal Frequency Division Multiplexing (OFDM):

While I have not looked much at the other versions in John's repository such as ARDOPOFDM that you mentioned, my understanding is that those contain experimental extensions or changes from what is in the protocol specification.

OFDM is one of the technologies incorporated into VARA HF and VARA FM. The use of OFDM in VARA HF and FM is one of the primary reasons that those systems work so well. The utility of OFDM in these experimental versions of ARDOP was confirmed by Jouko Nurma OH5RM:

From very beginning of Ardop here in OH [Finland] was a group of active testers for every new version, including [ARDOP2] and [ARDOPOFDM]. In these test we found [ARDOPOFDM] to be [about] twice as fast as the original. But as [ARDOP] lost sync often in our northern multipath conditions, people gradually changed to VARA HF for more reliability in Wilink communications and [ARDOP] [usage] dropped out here.

KG4JJA is concerned about interoperability of his "fork" with the current implementations of ARDOP:

Continuing forward, my intent is to further improve the reliability and usefulness of this implementation. To me, an important part of that reliability is for it *to be compatible with Ardop_Win*, as distributed with Winlink Express for Windows. Thus, I will try hard not to introduce any changes that are incompatible with the [ARDOP] protocol specification or

which appear to impair the ability to communicate with that implementation.

...

Also, in agreement with concerns Rick Meuthing has raised, I think that any software containing incompatible changes must be more clearly labeled as such, or given a completely different name so that all software claiming to be usable implementations of [ARDOP] are interoperable. Otherwise, users may be confused and attempts to communicate may fail.

Thus “advanced” ARDOP development that includes improvements such as OFDM (and, in my opinion, given how well VARA HF has proven out OFDM, any new systems for HF data communications absolutely *should* incorporate OFDM) might not retain the name “ARDOP”. Naming and versioning is a valid concern - it’s apparently a frustration that each new version of VARA HF (and new versions are occurring pretty frequently of late), aren’t interoperable with earlier versions of VARA HF.

Mercury and FreeDATA

In addition to KG4JJA’s promising work on evolving ARDOP, there are two other promising projects in progress to develop *new* (current Digital Signal Processing and software technology in the 2020s) “reasonably fast” and “reasonably reliable” data communications systems for Amateur Radio HF - Mercury and FreeDATA.

Mercury by [Rhizomatica](#) is developing a configurable open-source software-defined modem. I wrote about Mercury in **Zero Retries 0076** - Mercury - a Configurable Open Source Software Defined Modem. Development on Mercury has continued:

[Rafael Diniz PU2UIT on the users@ardop.groups.io mailing list](#):

I know this is a bit off-topic, but as we already discussed about future goals here - We just released Mercury modem 1.5:

<https://github.com/Rhizomatica/mercury>

We are keeping the TNC interface similar to [ARDOP], so we can do some comparisons soon. We did first tests over the air tests with negative SNR with success!

FreeDATA is a:

... versatile, open-source platform designed specifically for HF communications, leveraging Codec2 data modes for robust global digital communication. It features a network-based server-client architecture, a REST API, multi-platform compatibility, and a messaging system.

[Use-cases / What you can do with FreeDATA](#)

SEND DATA AND MESSAGES OVER HF CHANNELS

- **Direct Data Transmission:** Facilitates the direct transmission of data over HF channels, ideal for use in remote, disconnected, or emergency environments where traditional communication infrastructures are lacking.
- **Built-in Messaging System:** Allows for the sending of text messages and file attachments directly over HF channels, bypassing the need for conventional internet-based messaging services.
- **Asynchronous Messaging:** Messages are stored internally and delivered when the connection is established, supporting communication in environments with intermittent

or unreliable HF signal conditions. This improves chance, messages reach their destination despite connectivity challenges.

Thus we have now have at least *three* **open source** projects that have the potential for “reasonably fast” and “reasonably reliable” data communications for Amateur Radio HF communications. Couple these *software* projects with the many... *numerous*... open source Software Defined Transceivers available for HF, and it will be a very interesting next few years for data communications on Amateur Radio HF bands.

My thanks to Bill Buhler AF7SJ for pointing out Peter LaRue KG4JJA's posting on the users@ardop.groups.io mailing list. I'm now subscribed to that list.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

[Cornbread Road. Again.](#)



Image courtesy of Jeff Davis KE9V

The Cornbread Road audio serial is online again - for good this time!

Jeff Davis KE9V:

I recently uploaded the Cornbread Road audio series to the [Digital Library of Amateur Radio & Communications](#). DLARC is a project of the Internet Archive (the not-for-profit online library best known for The Wayback Machine.) DLARC is growing into a massive online

library of the past and present of ham radio and related communications.

It is funded by a grant from Amateur Radio Digital Communications ([ARDC](#)).

Cornbread Road was a ham radio mystery, produced in 13 audio episodes (10-15 minutes each) plus an epilogue and was originally released one week at a time between the summer solstice and autumnal equinox in 2010. I have reprised it here several times since then, but am pleased to see it enter the ham radio *zeitgeist* and will now be continuously available for download for many years to come.

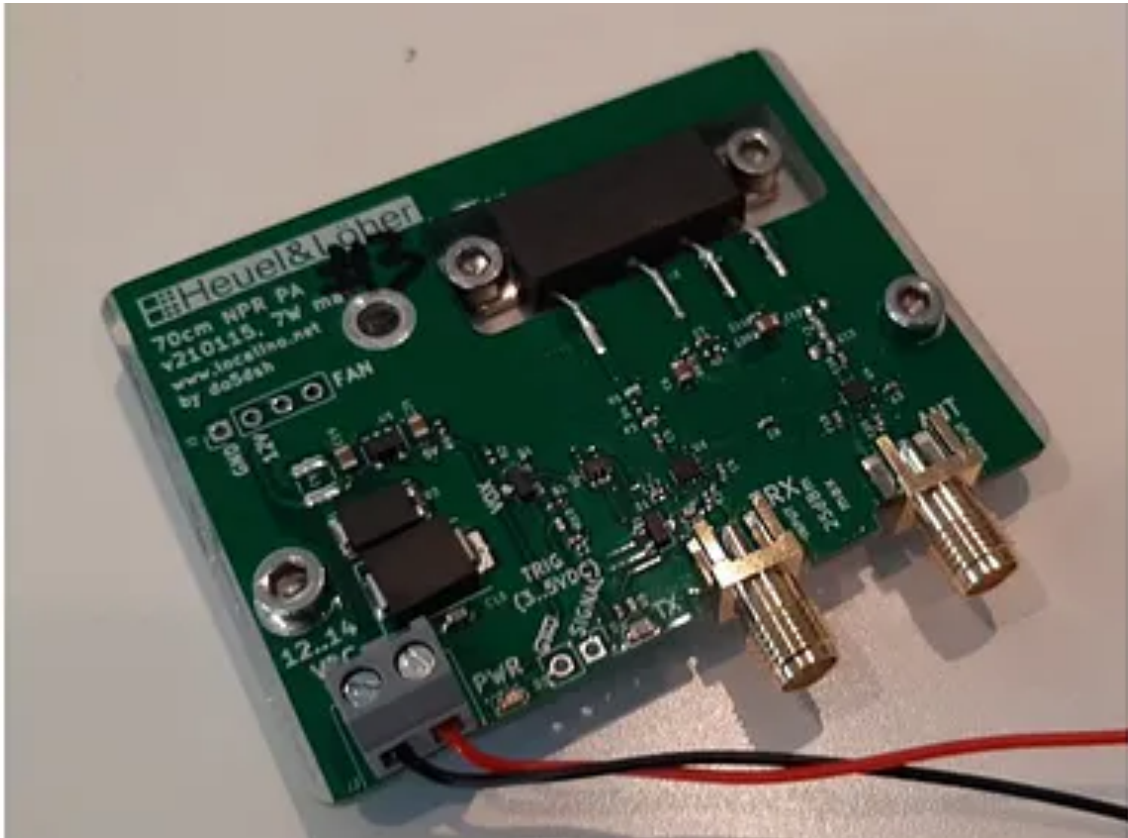
<https://archive.org/details/cornbread-road>

Deep in the Heartland a small group of ham radio enthusiasts enjoy an idyllic existence of wide open spaces, no antenna restrictions, low-noise levels, simple living, and good fellowship. But things aren't exactly as they seem. Unexplained lights in the night sky, radio signals masked from the ether, strange late night visitors to this small farming community...

I am beyond delighted that the Cornbread Road series is now *permanently* available for your (and my) *Zero Retries Interesting listening pleasure*, thanks to DLARC and KE9V. I'm doubly glad that the epilogue is included in the archive on DLARC. I'm gratified that I had a small role in making this happen with a mention of Cornbread Road in Zero Retries 01433.

Localino New Packet Radio Modem Version 2, NPR-H 2.0 - Back in Stock

in **Zero Retries 0137** - Localino New Packet Radio Modem Version 2, NPR-H 2.0, I mentioned a variant of the Open Source [New Packet Radio](#) (NPR) units designed and built by Localino. The Localino units offered a significant improvement over the original New Packet Radio units by including an *integral 7 watt power amplifier*, making these units *far more usable* than the original units that required a (sometimes hard to find and match) external power amplifier. At the time of the previous article, NPR-H 2.0 units were out of stock, but at the time, Localino assured me that "they'll make more", and as of this week, [units are back in stock on Tindie](#).



Localino power amplifier for New Packet Radio. Image courtesy of Localino / Tindie

And, speaking of “sometimes hard to find and match” external power amplifiers for original New Packet Radio units, Localino now has that covered also with a 38 dBm (7 watts) power amplifier:

What makes it special?

It has high power RF switches, a VOX trigger and digital input switch. For the lowest packet error rate you should use the digital 3-5V line connected from the NPR and auto switch the PA.

If you’re just getting started in New Packet Radio, definitely buy the NPR-H 2.0 units. If you buy a pair so that you can experiment with a co-conspirator within UHF simplex range, they are plug-and-play other than an enclosure, requiring only a 433 MHz antenna, 2A (minimum) 12 volt power supply, and a computer connected via USB. They are native TCP/IP devices, so any application that works with TCP/IP will work with New Packet Radio.

It’s tiresome, but necessary to repeat this caveat when discussing the use of NPR units in the US: *Currently, you have to “dial down” NPR to use only a 100 kHz channel* because of the FCC’s arcane maximum bandwidth regulations for the US Amateur Radio VHF / UHF bands. Other countries do not have such bandwidth limitations and thus NPR can operate use a 1 MHz channel and operate at its maximum 1 Mbps. We US Amateur Radio Operators *hope* that the FCC will remove those restrictions in [Docket 16-239](#) and thus we’ll be able to operate NPR at 1 Mbps. But, to date, nothing heard from the FCC.

Only slightly facetious... but I wonder if a group of Amateur Radio Operators (or an Amateur Radio organization) were to file for a Special Temporary Authority (STA) to operate NPR at maximum channel size of 1 MHz for 1 Mbps would “get some attention” at the FCC to complete Docket 16-239.

[The Most Hackable Handheld Ham Radio Yet](#)

Stephen Cass [likely KB1WNR] in IEEE Spectrum:

The UV-K5 can be modded at the click of a mouse.

All right, confession time. I don't use my handheld ham radio for much more than eavesdropping on the subway dispatcher when my train rumbles to a mysterious halt in a dark tunnel. But even I couldn't help but hear the buzz surrounding a new handheld, Quansheng's UV-K5.

It caught my attention in part because for over a decade, Baofeng has been the name in Chinese handhelds. In 2012 Baofeng made waves with its UV-5R radio, upending the sleepy handheld-transceiver market. Prior to the 5R, the price tag of the cheapest VHF/UHF handheld was a little north of US \$100. The 5R sold for a quarter to a third of that. Hams grouched about the 5R's so-so technical performance—and then bought a couple anyway, so they'd always have a radio in their car or workplace.

Now it's Quansheng that's making a splash. The UV-K5, released last year, might be the most hackable handheld ever, with a small army of dedicated hams adding a raft of software-based improvements and new features. I had to have one, and \$30 later, I did.

There were some Zero Retries Interesting points in this article, such as

- Another mod allows you to exchange text messages between K5s.
- A modder known as whosmatt has created a Web-based patcher/flasher for the K5 that lets you pick a selection of mods from a menu. It then combines them with the official firmware to create a custom image for uploading (as long as you don't exceed the total amount of memory).
In fact, if you're using Chrome, Edge, or Opera, you don't even need to use Quansheng's installer to upload the firmware: You can update the radio's flash memory directly from the browser via the built-in Web Serial API and the USB programming cable.

That hobbyists / hackers have figured out how to “super-purpose” hardware to add functionality that wasn't within the original design scope isn't exactly news⁴. After reading the teaser headline and the article, my most burning question is whether, solely with software, could the UV-K5 run the M17 protocol for digital voice / text messaging? I haven't seen an answer yet, but it appears that Wojciech Kaczmarski SP5WWP (primary developer of M17) [is “on it”](#).

Most interesting, to me, was the “meta” of this article - that the prestigious IEEE Spectrum decided to cover *Amateur Radio* experimentation, and thus speak to the relevance and interest and technical experimentation possible with *modern* Amateur Radio. *That...* is **notable**!

[What is DECT-2020 New Radio \(NR\), and How Big a Deal Is It?](#)

DECT-2020 NR operates in the global, license-exempt 1.9 GHz band, which means you can set up a network without frequency planning or spectrum leasing costs. Since this 1.9 GHz band is globally available, it also enables utilizing a single radio, bill of material, and hardware version for use everywhere.

Consequently, DECT-2020 NR is completely ‘non-cellular’ and doesn't require cellular mobile networks or existing infrastructure, such as base stations, to operate. With DECT-2020 NR, you simply build your own private wireless network in which every node can be an access point with a direct backhaul connection to the Internet. (In DECT-2020 NR terminology, this is called a 'sink node'.)

This lack of centralized setup and operation immediately enables self-organizing and healing mesh networking wireless topologies and all their reliability benefits. For example, no single point of failure can bring down an entire network because traffic can be rerouted automatically and rapidly around the failure node or even back-up sink nodes.

DECT was originally an acronym for Digital Enhanced Cordless Telecommunications⁵ technology, but now it seems to mostly be a brand name. DECT is a decent standard for cordless telephones using digital modulation and semi-secure encryption as opposed to the cheaper analog (and thus, insecure) technology that was originally used in cordless phones for the US market.

While this article was published in 2021, it surfaced in one of my feeds *this* week. Even though it three years old, I thought it was still Zero Retries Interesting as I wasn't previously aware of the existence of DECT-2020.

Despite that the above article states “global, license-exempt 1.9 GHz band”, in the US, ***only 1.92 - 1.93 GHz (10 MHz) is license-exempt***. In the US, this portion of 1.9 GHz is called [Unlicensed Personal Communications Service \(UPCS\)](#). In the US, the remainder of the 1.9 GHz band was allocated for licensed use in [various auctions](#).

DECT-2020 Incorporated into “5G” Standards

An [article in EE Times](#) states:

As of Feb. 24, 2022, DECT-2020 has been adopted as “the first global non-cellular 5G technology” and will be included in the 5G standards by the International Telecommunication Union’s Radiocommunication Sector (ITU-R). DECT Forum, a non-profit industry organization, is promoting the standard under the name New Radio plus (NR+).

What I found Zero Retries Interesting was that DECT-2020 is claimed to be included in the “5G” standard and thus the capability to operate in the 1.9 GHz band *without need of cellular infrastructure* is theoretically *built in* to modern mobile telephones. Thus it’s theoretically possible for a newer mobile telephone to be more usable⁶ in the case of a mobile network failure if a “DECT-2020” / NR+ network can be made available.

More about [NR+ standard](#) within the [DECT Forum](#):

The DECT Forum is pleased to announce NR+ an entirely new wireless technology emerging from the DECT lineage that started almost 30 years ago. This new radio is not an adaptation of DECT, but a completely new OFDM-based RF technology standard aimed squarely at serving the needs of non-cellular professional stand-alone wireless networks.

It heralds the chance at last, for private businesses or ventures to deliver the widest range of local voice, data and IoT services – with one technology!

Recently approved by ITU-R WP5D, it is the world’s first non-cellular 5G technology standard. As with the original DECT, the standard was developed by ETSI bringing together industry experts in pro-audio, IoT and RF technology with the support of the DECT Forum membership.

Although a completely new technology, NR+ will share the regulations associated with DECT, allowing NR+ to co-exist with DECT in the license-free 1.9 GHz band that is available in most parts of the world. It also builds on the well-proven advantages of DECT that have made the technology a favourite of developers of networked voice & data systems that require very high reliability and outstanding quality of service.

I was not able to find an actual product that makes use of NR+, but apparently it's still early days for NR+. Nordic Semiconductor is one vendor that will be [manufacturing chipsets for NR+](#) with first availability in February, 2024. This was encouraging:

Is there any license or subscription to pay?

The DECT NR+ technology standard is open and freely available to start developing. DECT NR+ technology does not have subscriptions.

This has some interesting implications for new products and services that can make use of the UPCS band in the US and potentially more portions of the 1.9 GHz band in other countries. One interesting aspect of 1.9 GHz compared to other license-exempt portions of spectrum such as 2.4 GHz is that given the long history of DECT, "voice" is a well-standardized protocol in 1.9 GHz, and thus there could be new devices that seamlessly interleave voice, messaging, and data using well-defined standards. Thus different manufacturer's devices could / should / *might* be interoperable. If the DECT NR+ technology standard really is "open and freely available", it might be interesting to see if its OFDM technology could be adapted for Amateur Radio use, such as the 1240 - 1300 MHz band or even smaller portions of spectrum such as 50-54 MHz or 222 - 225 MHz.

[New 44Net Portal coming Wednesday, April 3rd!](#)

Rosy Schechter KJ7RYV on the 44Net mailing list(s):

I'm pleased to share that on Wednesday, April 3rd, at approximately 9am PDT / 4pm UTC, Chris G1FEF will release a new 44Net portal. We'll give you a heads-up once we make the switch; expect some downtime starting at about 1am PDT / 8am UTC until launch time.

Here are the features the new portal will include:

- A new ticketing system to improve support response time
- DNS management
- Modern secure framework
- Improved UI/UX
- Capability to facilitate a pool of administrators

Of course, the portal upgrade will not change your address space assignment.

Also, along with any new launch – though we have done thorough testing with the TAC and staff– we expect that folks will find some bugs. We appreciate your patience should you find them, as well as your feedback.

If you have any questions in the meantime, please ask here or direct them to newportal@ardc.net.

Kudos to ARDC for this. The previous portal was practically an institution in itself, and it had to be difficult to tease out all the issues from the nooks and crannies of the old portal that had been patched and added onto over the decades.

Hopefully this lays some groundwork for the future 44Net VPN service.

[Talking Hot Dog Gives New Meaning to 'Ham Radio'](#)

A couple months ago, soon after we posted our [If I touch this tower, I die](#) video, a few commenters mentioned you likely wouldn't *die* after touching a high-power AM tower—rather, you'd have serious RF burns.

I was trying to figure out a way to *somewhat* safely test the scenario: what would happen if someone walked up and touched the tower, while standing on the ground?

No test scenario can be perfect—and with high-power RF, 100% safe... but after discussing it with my Dad a bit, we determined a hot dog could be a decent proxy for a human finger, and holding it far away on a wooden rod would provide enough safety margin, assuming we accounted for [RF exposure limits](#) at the site.

When I saw the title of this video on YouTube, I was skeptical. But after watching it, new Amateur Radio Operators Jeff Geerling KF0MYB and Joe Geerling KF0MYJ applied reasonable rigor about appropriate RF exposure limits for being in close proximity to an AM broadcast antenna driven by a 6 kW transmitter. Watching “the test” leaves an impression to be very cautious around antennas driven by high-power transmitters.

Ectobius - Zero Retries Interesting Amateur Radio Satellite

[Amateur Radio Newsline Report 2420 for Friday March 15, 2024:](#)

ULTRA-SMALL SATELLITE HAS AMATEUR RADIO CAPABILITY

JIM/ANCHOR: Meanwhile, just a few days earlier, a few dozen satellite were sent into space and among them was an ultra small CubeSat available for amateur radio use. Andy Morrison K9AWM tells us about it.

ANDY: Weighing just 1.3 kg, the small satellite known as Ectobius was launched on the 4th of March in California aboard a SpaceX Falcon 9 to conduct radar detection of the Earth. It will also provide amateur radio access.

The creators, Care Weather and the Brigham Young University Spacecraft Club, are calling this the smallest satellite radar system ever in orbit. CareWeather said it is the first in its fledgling series of weather satellite precursors. Ectobius, a 1U CubeSat, was among 53 payloads on board SpaceX's Transporter-10.

The university club will be coordinating the sharing of amateur radio activity. Hams will be able to use the CubeSat as a mailbox, digipeater and telemetering station if they wish to study CubeSat thermals.

According to the CareWeather and BYU club website, Ectobius is expected to have an orbital life of three years, although the duration of its scientific mission is only two months.

This is Andy Morrison K9AWM.

Kudos to Amateur Radio Newline for surfacing this interesting development - *I haven't seen mention of this new Amateur Radio satellite anywhere else.*

This is one of the few (or perhaps the only?) Amateur Radio satellite in the past decade (or two?) that includes a “mailbox” feature and (apparently) only providing data communications rather than a “flying repeater”, thus it's Zero Retries Interesting. That said, there is *frustratingly little information currently available* about the Amateur Radio subsystem of the Ectobius satellite.

The [BYU Spacecraft Club page](#) has nothing about Ectobius.

The [BYU Amateur Radio Club page](#) has nothing about Ectobius.

[satnews](#) - *Ectobius will also be available to amateur radio operators to use as a mailbox, digipeater, and telemetering station for the study of cubesat thermals. The satellite was built by Alex Laraway and Patrick Walton.*

[Care Weather](#) - *Ectobius will also be available to amateur radio operators to use as a mailbox, digipeater, and telemetering station for the study of cubesat thermals.*

I guess we're just going to have to wait for someone in the BYU Spacecraft Club (which is named, repeatedly, as the management for the Amateur Radio activity of this satellite) to publish the details of Amateur Radio activities on Ectobius.

[The Modern Ham - Ultimate Direwolf TNC Installation Guide for Windows and Linux](#)

This is follow up to my [introduction](#) on Packet Radio. [Direwolf](#) is a software TNC, and one of the best things to happen to packet radio in the 21'st century. Gone are the days of expensive [Kantronics TNC's](#). Direwolf gives us a free, opensource TNC, that is highly customizable for just about every need, and runs on about any system we have laying around. The TNC is the foundation of any packet radio system, that's why we are starting here. This will serve as the reference point for every other tutorial we do in the packet radio series. But with great power comes some type of learning curve. That's why I'm making the Ultimate guide to Direwolf TNC for Packet Radio. If you're more of a documentation buff, and don't need anyone to hold your hand, you can dig into the official docs [here](#).

The following guide will get you a working direwolf installation with **basic** configuration. Proceed to the next post to tweak the settings and get it tuned for your radio. Although it includes instructions for VOX, I highly discourage it, and you will most likely not have a good time on anything other than APRS.

This is a *thorough* written treatment on getting Dire Wolf Software TNC installed, configured, and working. Kudos to Billy Penney KN4MKB - this document and procedure was obviously a *lot* of work!

Leave a comment

Share

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having*

a license to experiment with radio technology, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything!*
- **Founding Members who generously support Zero Retries financially:**
Founding Member 0000 - Steven Davidson K3FZT
Founding Member 0001 - Prefers to Remain Anonymous 01

Founding Member 0002 - Chris Osburn KD7DVD
Founding Member 0003 - Don Rotolo N2IRZ
Founding Member 0004 - William Arcand W1WRA
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Founding Member 0006 - Todd Willey KQ4FID
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Founding Member 0009 - Prefers to Remain Anonymous 19
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your [QRZ](#) page (or other web presence) and include a link:

<https://www.zeroretries.org>
- If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- [Dan Romanchik KB6NU](#) mentions “Zero Retries Interesting” topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- [Jeff Davis KE9V](#) also mentions “Zero Retries Interesting” topics so regularly on his blog (that I

otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.

- [Amateur Radio Weekly](#) by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- [Experimental Radio News](#) by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC. It's a *must-read-now* for me!
- [RTL-SDR Blog](#) - *Excellent* coverage of Software Defined Radio units.
- [TAPR Packet Status Register](#) has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- [HB9BLA Wireless](#) by Andreas Spiess HB9BLA
- [KM6LYW Radio](#) by Craig Lamparter KM6LYW (home of the [DigiPi project](#))
- [Modern Ham](#) by Billy Penley KN4MKB
- [Tech Minds](#) by Matthew Miller M0DQW

Zero Retries is currently using the [Substack email publishing platform](#) to publish Zero Retries. It's particularly suitable for small newsletters as you can get started for no cost.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join **1400+** other subscribers:

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Social Media:

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

[Zero Retries / N8GNJ on Mastodon](#)

Zero Retries (N8GNJ) is also on Bluesky — [@n8gnj](#) — just click:

[Zero Retries / N8GNJ on Bluesky](#)

Email issues of Zero Retries are “instrumented” by [Substack](#) to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- [SuperPacket blog](#) — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- [N8GNJ blog](#) — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!

Steve Stroh N8GNJ / WRPS598 (He / Him / His)

These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham ([The City of Subdued Excitement](#)), Washington, USA, and linked to the Internet via [Starlink Satellite Internet Access](#).

2024-03-29

Blanket permission is granted for TAPR to use any Steve Stroh content in Zero Retries for the TAPR Packet Status Register (PSR) newsletter (I owe them from way back).

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[1](#)

I nearly made a comparative reference to a certain ubiquitous, obnoxious insect common in urban areas, which apparently can survive nearly any challenge, including nuclear war. But, the “ick” factor for some might have derailed further reading of the story, thus I didn't make that comparative reference.

[2](#)

“Venture capital” isn't quite an accurate description as VCs hope to have their investment returned (multiple times over), whereas ARDC provides *grants* which do not have to be repaid (assuming that the project is attempted in good faith and the grant funds spent appropriately).

[3](#)

Credit where due - that mention was also a [link to a fawning article about Cornbread Road by by fellow Cornbread Road fanboy Steve Weinert K9ZW](#).

[4](#)

One prime example of this is the origins of the [OpenWRT project](#) - see the History section.

[5](#)

My memory is that the original acronym for DECT was Digital *European* Cordless *Telephone*.

[6](#)

Beyond what's possible with a web browser and apps that use Internet and Wi-Fi.